§ 31.43 Fitting factor.

(a) A fitting factor of at least 1.15 must be used in the analysis of each fitting the strength of which is not proven by limit and ultimate load tests in which the actual stress conditions are simulated in the fitting and surrounding structure. This factor applies to all parts of the fitting, the means of attachment, and the bearing on the members joined.

(b) Each part with an integral fitting must be treated as a fitting up to the point where the section properties become typical of the member.

(c) The fitting factor need not be used if the joint design is made in accordance with approved practices and is based on comprehensive test data.

§ 31.45 Fuel cells.

If fuel cells are used, the fuel cells, their attachments, and related supporting structure must be shown by tests to be capable of withstanding, without detrimental distortion or failure, any inertia loads to which the installation may be subjected, including the drop tests prescribed in § 31.27(c). In the tests, the fuel cells must be loaded to the weight and pressure equivalent to the full fuel quantity condition.

[Amdt. 31–3, 41 FR 55474, Dec. 20, 1976]

§ 31.46 Pressurized fuel systems.

For pressurized fuel systems, each element and its connecting fittings and lines must be tested to an ultimate pressure of at least twice the maximum pressure to which the system will be subjected in normal operation. No part of the system may fail or malfunction during the test. The test configuration must be representative of the normal fuel system installation and balloon configuration.

[Amdt. 31–3, 41 FR 55474, Dec. 20, 1976]

§ 31.47 Burners.

(a) If a burner is used to provide the lifting means, the system must be designed and installed so as not to create a fire hazard.

(b) There must be shielding to protect parts adjacent to the burner flame, and the occupants, from heat effects.

(c) There must be controls, instruments, or other equipment essential to the safe control and operation of the heater. They must be shown to be able to perform their intended functions during normal and emergency operation.

(d) The burner system (including the burner unit, controls, fuel lines, fuel cells, regulators, control valves, and other related elements) must be substantiated by an endurance test of at least 40 hours. Each element of the system must be installed and tested to simulate actual balloon installation and use.

(1) The test program for the main blast valve operation of the burner must include:

(i) Five hours at the maximum fuel pressure for which approval is sought, with a burn time for each one minute cycle of three to ten seconds. The burn time must be established so that each burner is subjected to the maximum thermal shock for temperature affected elements;

(ii) Seven and one-half hours at an intermediate fuel pressure, with a burn time for each one minute cycle of three to ten seconds. An intermediate fuel pressure is 40 to 60 percent of the range between the maximum fuel pressure referenced in paragraph (d)(1)(i) of this section and minimum fuel pressure referenced in paragraph (d)(1)(iii);

(iii) Six hours and fifteen minutes at the minimum fuel pressure for which approval is sought, with a burn time for each one minute cycle of three to ten seconds;

(iv) Fifteen minutes of operation on vapor, with a burn time for each one minute cycle of at least 30 seconds; and

(v) Fifteen hours of normal flight operation.

(2) The test program for the secondary or backup operation of the burner must include six hours of operation with a burn time for each five minute cycle of one minute at an intermediate fuel pressure.

(e) The test must also include at least three flameouts and restarts.

(f) Each element of the system must be serviceable at the end of the test.

[Doc. No. 1437, 29 FR 8258, July 1, 1964, as amended by Amdt. 31–2, 30 FR 3377, Mar. 13, 1965; Amdt. 31–7, 61 FR 18223, Apr. 24, 1996; 61 FR 20877, May 8, 1996]

§ 31.49 Control systems.

(a) Each control must operate easily, smoothly, and positively enough to allow proper performance of its functions. Controls must be arranged and identified to provide for convenience of operation and to prevent the possibility of confusion and subsequent inadvertent operation.

(b) Each control system and operating device must be designed and installed in a manner that will prevent jamming, chafing, or interference from passengers, cargo, or loose objects. Precaution must be taken to prevent foreign objects from jamming the controls. The elements of the control system must have design features or must be distinctly and permanently marked to minimize the possibility of incorrect assembly that could result in malfunctioning of the control system.

(c) Each balloon using a captive gas as the lifting means must have an automatic valve or appendix that is able to release gas automatically at the rate of at least three percent of the total volume per minute when the balloon is at its maximum operating pressure.

(d) Each hot air balloon must have a means to allow the controlled release of hot air during flight.

(e) Each hot air balloon must have a means to indicate the maximum envelope skin temperatures occurring during operation. The indicator must be readily visible to the pilot and marked to indicate the limiting safe temperature of the envelope material. If the markings are on the cover glass of the instrument, there must be provisions to maintain the correct alignment of the glass cover with the face of the dial.

[Doc. No. 1437, 29 FR 8258, July 1, 1964, as amended by Amdt. 31–2, 30 FR 3377, Mar. 13, 1965]

§ 31.51 Ballast.

Each captive gas balloon must have a means for the safe storage and controlled release of ballast. The ballast must consist of material that, if released during flight, is not hazardous to persons on the ground.

§ 31.53 Drag rope.

If a drag rope is used, the end that is released overboard must be stiffened to preclude the probability of the rope becoming entangled with trees, wires, or other objects on the ground.

§ 31.55 Deflation means.

There must be a means to allow emergency deflation of the envelope so as to allow a safe emergency landing. If a system other than a manual system is used, the reliability of the system used must be substantiated.

[Amdt. 31–2, 30 FR 3377, Mar. 13, 1965]

§ 31.57 Rip cords.

(a) If a rip cord is used for emergency deflation, it must be designed and installed to preclude entanglement.

(b) The force required to operate the rip cord may not be less than 25, or more than 75, pounds.

(c) The end of the rip cord to be operated by the pilot must be colored red.

(d) The rip cord must be long enough to allow an increase of at least 10 percent in the vertical dimension of the envelope.

§ 31.59 Trapeze, basket, or other means provided for occupants.

(a) The trapeze, basket, or other means provided for carrying occupants may not rotate independently of the envelope.

(b) Each projecting object on the trapeze, basket, or other means provided for carrying occupants, that could cause injury to the occupants, must be padded.

§ 31.61 Static discharge.

Unless shown not to be necessary for safety, there must be appropriate bonding means in the design of each balloon using flammable gas as a lifting means to ensure that the effects of static discharges will not create a hazard.

[Amdt. 31–2, 30 FR 3377, Mar. 13, 1965]